Maria Karpman, 2/8/2011

1) P.7 – Assessment Process
   It was not clear to me whether this section describes the process for developing asset rating program in general, or steps that must be followed by individual buildings to generate the asset rating score.

2) P.8, Section 1.1
   "…asset ratings evaluate the energy performance of the building based on the thermal envelope (e.g. insulation, windows) and mechanical and electrical systems, irrespective of tenant behavior. … the goal of an asset rating is to provide the information necessary to enable the real estate market to value energy performance intrinsic to the building"
   It may help to include an example for what is considered to be operational problem versus an 'asset' problem. A building with low operational rating may have high heating costs because of significant air leakage, faulty distribution system and/or heating controls that result in overheating. What do you believe the asset rating should be for this building? Infiltration, distribution and control problems are not addressed by ASHRAE 90.1 modeling, so if the asset rating model relies on standard assumptions in these areas the building may get high asset rating score. Do you believe it should? The associated problems may be difficult and expensive to fix…

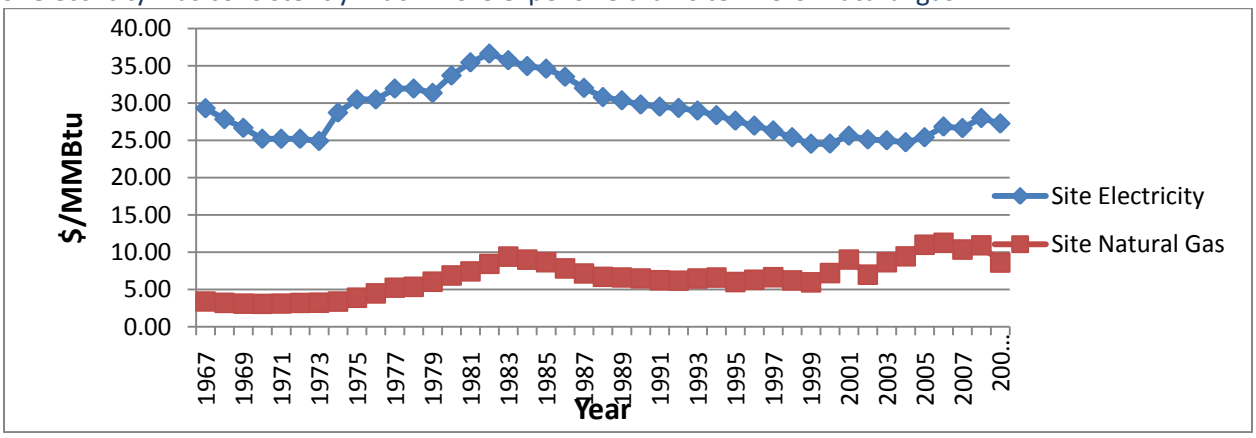
3) P.10 (C) says "..Combining an asset rating with an operational rating can provide detailed information that can enable building operators, owners and tenants to identify, prioritize, and justify energy investments and strategies." Operational rating is based on total building energy consumption for all fuels normalized by key variables such as building area. Proposed asset rating would be based on model that utilizes standard operating assumptions. How would these two separate scores help identify or prioritize investment in energy efficiency? ASHRAE Guideline 14 and International M&V protocols suggest calibrated simulation for comprehensive benefit-cost analysis of alternatives.
   It may help to include an example on how operational and asset ratings may be interpreted in practical situations. For example, if a building has poor operational rating but good asset rating, does it mean that it simply needs a new super ☺?

4) P.15 (F) DOER participates with ASHRAE Building EQ pilot. Are there any issues that would prevent you from adopting it for MA? It would be interesting to know more about your experience with ASHRAE system to inform the asset rating development process.

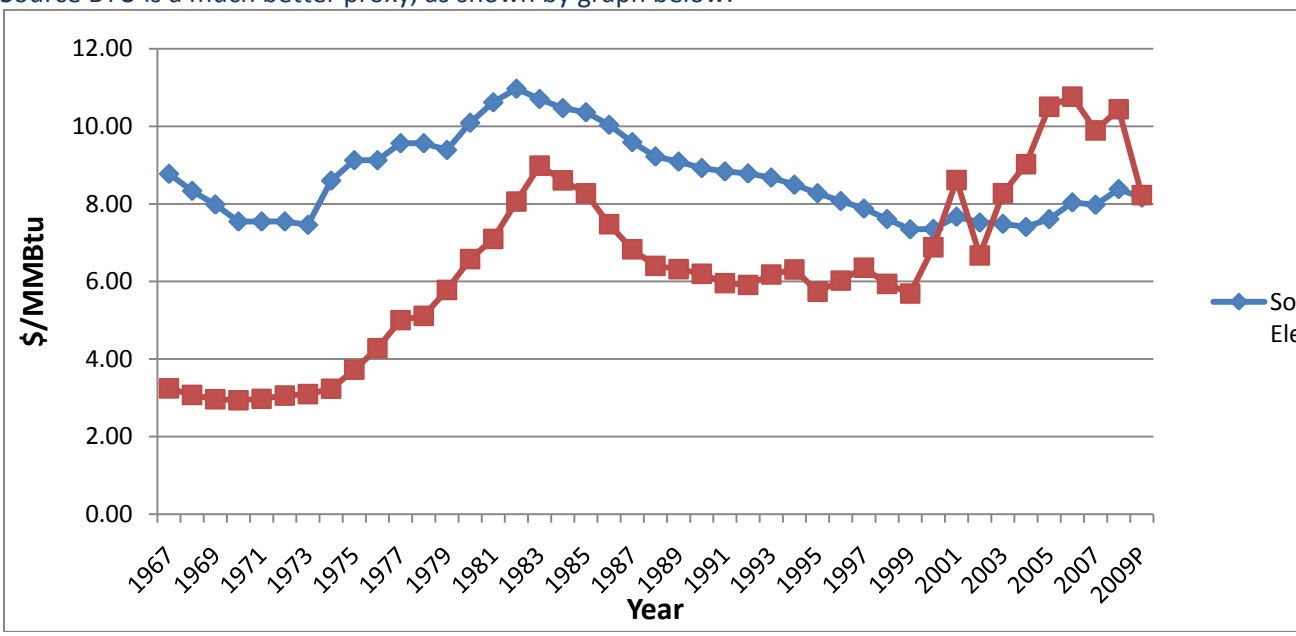
5) P.16 (B) I like the idea of using DOE benchmark as a target.

6) P.17 (C): Site versus source energy.
   - Discussion part of the section only mentions site and source energy as possible metrics, overlooking energy cost which is the third very popular alternative. Energy cost is used by both ECB and Appendix G protocols of ASHRAE 90.1, and has several significant advantages, such as ability to capture demand and time of use patterns. These have strong impact on energy cost, which is of primary interest to property owners, and grid stability.
   - The section suggests that "…energy metric that is of most interest to building owners and operators when comparing buildings, and informing decision-making around investments in the energy performance of the building, is site energy use per square foot (a site EUI), as this

serves as a durable proxy for cost over time." I have to disagree with that. The graphs below with electricity and natural gas cost per site and source BTU since 1969 (based on information posted on EIA website, supporting calculations are attached) show that site BTU of electricity was consistently much more expensive than site BTU of natural gas.



Source BTU is a much better proxy, as shown by graph below:



If ratings are based on site energy, an electrically heated building would be rated higher than a building heated with fossil fuels, even though it would cost more to operate.
If we are looking for a proxy to energy cost, why not just use energy cost? It has associated challenges, but is consistent with ASHRAE 90.1 protocols.

7) P.18 (E): COMNET Data Normalization
   - If I understand this section correctly, it suggests using the standard ASHRAE 90.1 Appendix G/ECB/COMNET assumptions for asset rating models of existing buildings. As attractive as it is in its simplicity (if anything that involves modeling commercial buildings can be described as simple), I am afraid it misses a very important opportunity of using energy modeling to trouble-shoot building performance, identify weak areas, and support benefit cost analysis of retrofit options, because all these tasks can only be effectively accomplished by

calibrating model to utility bills. Using standard assumption may seem as a logical approach for an asset rating methodology, but it would turn modeling into an expensive (and inaccurate, see the next point below) accounting tool, instead of having it used proactively to improve building performance. As suggested in executive summary, "…operational data is critical for some programs (e.g. quantifying the effectiveness of efficiency measures)".

- LEED NC models are developed using comprehensive information about future building from drawings and specs. In spite of wealth of available data, many LEED models proved to be highly inaccurate. ASHRAE warns that Appendix G models are not predictive of energy consumption, but we all hope that they are at least somewhere in the right ballpark, and unfortunately they are often not. Modeling existing buildings is much more challenging since the original design info may be missing, some systems/equipment may have been replaced, some may be malfunctioning, there is some age-related deterioration of components, etc. To ensure confidence in results, a detailed energy audit is typically required, and must often be supplemented with measurements. To further improve confidence that the field conditions are captured correctly, the models are calibrated to utility bills. (The process of modeling existing buildings is described in ASHRAE Guideline 14.) The use of default assumptions makes reality checks using billing data impossible, providing a good excuse for potentially large discrepancy between billing data and model results. But how do we know if the difference is due to use of standard assumptions and not misrepresentation of the building condition?

8) P.18 (A)
The section suggests that "..operational ratings of existing buildings can be used to improve the accuracy of energy models used to create asset ratings". How do you see this happening? Operational ratings tend to not separate usage by either end use (heating, cooling, lighting, etc.) or by fuel, only reporting an overall energy consumption normalized by key parameters, or a score compared to peers. How can this inform modeling?

9) P.20 (D)
I agree that BEERR should be among the key outcomes of energy modeling. But don't the earlier sections suggest that asset model may not be a good fit for developing retrofit recommendations due to use of default assumptions?

10) P.20 (2.3 A, B)
Good additional resources on that are ASHRAE Guideline 14 and International M&V Protocols.

11) P.21 C
Magnitude of potential energy cost savings and cost of retrofits in commercial buildings is substantial enough to justify a much more detailed report than what is shown on this page. It's hard to imagine that commercial real estate owner may use a brief report like that to make investment decisions, or that utility company would consider it adequate for awarding incentives. I was involved for many years with implementing modeling-based incentive programs including NYSERDA Multifamily Performance Program (new

and existing buildings) and NJ Pay for Performance (P4P) program for new and existing commercial, multifamily and industrial buildings. These programs require calibrated models for existing buildings and have much more detailed report template than the currently shown BEERR. In my limited personal home-buying experience, even an engineering inspection performed before finalizing the purchase of a single family home generates a more detailed report than what is shown on the picture.

12) P. 22
ASHRAE already has some of the needed certifications – for example, it rolled out Building Energy Modeling Professional (BEMP) certification over a year ago.

13) P22 (E)
It is important to set realistic goals for the cost of assessment, and it is hard to imagine that both operational and asset rating of a commercial building can be performed by a single assessor in a single visit, as Discussion section seems to imply. Proper assessments can save commercial building owners tens or hundreds thousands in annual fuel costs and earn substantial incentives. Isn't much higher assessment costs justified?
Commercial buildings vary widely in size and complexity. Maybe set assessment cost goals in $/SF? Or make it proportional to building energy cost? (The higher the utility costs, the more time should be spend analyzing the building, and the more savings/incentives may be realized).

14) P.23 (F)
Using the same protocol for new and existing buildings is very attractive, but I am not sure it is practically possible given significant uncertainty associated with performance characteristics of systems and equipment in existing buildings. In addition, it seems that component age should be a big factor in evaluating building asset values, but it is not at all captured through modeling. For example, if two chain stores were built using the same specs, but one is new and another was completed 10 years ago, shouldn't the new one have higher asset value? How would it be captured through modeling? It seems like you'd need to come up with some performance deterioration factors for various components, which is quite an ambitious project (I am not aware of existing source that is comprehensive enough to support whole building modeling.

Below are several additional thoughts/suggestions.

Asset Rating Method

It is customary to hire an engineer when an existing single family home changes hands. In my limited home-buying experience, inspectors use standard templates that list key building components, and include notes regarding system condition and age. Isn't there a similar practice for commercial buildings? The asset rating system could use the existing industry practices as a starting point, but shift the emphasis to energy efficiency. For example, a standard template may be developed to show side by side the related minimum requirement of ASHRAE 90.1 2007, and performance of the actual building for all systems / components (heating/cooling efficiency, wall U-value, lighting power density, etc.). Since the template will also include age and condition of each component, it would help owner prioritize improvements to address both energy efficiency and age-dictated replacements.

This would be similar to prescriptive approach that is already used as alternative to modeling by ASHRAE 90.1 (which has prescriptive and performance paths), state energy codes, and wide range of other programs including LEED, HERS, EPA Energy Star for Multifamily, etc.

With some creative thought, prescriptive approach may be enhanced to produce a score similar to performance path. For example, a technical scale may be developed for each regulated component using the same general approach as outlined in the paper, and then some weighing factors may be used to calculate a whole-building score. As noted in the paper, developing a scale requires two points. The first point could be based on the related prescriptive requirements of 90.1; the second point could be based on ASHRAE Standard 189, or 50% Energy Savings Design series funded by DOE, or ASHRAE Advanced Energy Guides, or another similar source. For example, for lighting in an office building the first point may be set at 1.0 W/SF Lighting Power Density (LPD) based on 90.1 2007. The second point could be 0.75 W/SF based on "Technical Support Document: 50% Energy Savings Design Technology Packages for Medium Office Buildings" by PNNL, developed as part of DOE-sponsored 50% improvement series. The weight of lighting category (or maximum number of points in this group, similar to LEED approach) could be set based on contribution of lighting toward overall building energy cost. For this purpose, an energy allocation by end use may be taken from the DOE Benchmark series mentioned in the paper, CBECS, or similar source. For example, if lighting is known to account for 35% of energy cost in an office building (I have not checked what it actually is), the weight of lighting category could be set appropriately.

The prescriptive path could be an alternative to a modeling-based approach outlined in the paper. It will require detailed energy audit of the building, which I think is a must for any energy-oriented asset rating. It would be transparent to building owner because it will clearly outline strength and weaknesses of each component in the building, and will allow him to make a project-specific judgment on cost of improving each particular area (for example, depending on roof structure, it may or may not be difficult to add insulation to it). If whole building calibrated model is later developed for the project to help evaluate cost-effectiveness of retrofit alternatives, it would rely on the field data collected for asset rating, helping eliminate redundant efforts.

The asset rating program could require that new buildings always use performance path (energy modeling), or have a choice of using either performance or prescriptive path. For example, prescriptive path may only be allowed for smaller new buildings.

As I mentioned in comments above, I doubt that reliable models of existing buildings may be developed without a very detailed audit, site measurements, and calibration to utility bills. Given that, I would not allow performance path to rate assets of existing buildings, and rely only on prescriptive path. There could be some exceptions to that. For example, if a model was developed for the building when it was new following the proper protocol, and all retrofit work is known and clearly documented, this original model may be modified to reflect the changes and used for asset rating.